

ON GLACIAL DEPOSITS AT WEST PHILADELPHIA.

(WITH A MAP.)

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In a preceding paper on Glacial Deposits in Carbon, Northampton, and Monroe Counties, published in the Proceedings of the Philosophical Society, I proved that the glaciers passed through the gaps of the Kittatinny Mountain and followed somewhat the courses of the present river beds, at all events toward the close of their existence.

The southern boundary of the Glaciers is a question which will require much careful study to determine. It is, however, probable that they reached much further south than generally supposed, and it would scarcely be probable that a mass of ice, great enough to pass over the highest ranges of the White, Green, and Adirondack Mountains, to suddenly end at so short a distance as the Blue, or Kittatinny Mountain.

I will take this opportunity to speak of the double systems of Glacial scratches so plainly marked in the more northern country. I have observed on the shores of Lake Champlain, the polished surfaces indicating a movement of the ice in a line nearly parallel to the lake, or a southerly movement, while a few miles back from the lake, many of the valleys are crossed by moraines, which indicate Glaciers moving in an easterly and south-easterly direction towards the lake, and polished surfaces and scratches indicating the same. I concluded from this that one system of scratches indicate the course of the moving ice when it was so great as not to be influenced by the topographical features of the country. And the second system, formed after the mass had so melted away that it followed the depressions of the surface.

It is my object, in the following, to show that we have Glacial deposits within the limits of the City of Philadelphia. Since my residence in this City the *alluvial* deposit has occupied my attention. It is composed of sand, rounded quartz pebbles, and gravel, of sandstone and conglomerate. It varies in depth from two and three feet to twenty-five. Intermingled with the rounded quartz pebbles, are found everywhere, angular pieces of softer sandstone, as Medina and New Red, which would necessarily have been worn into rounded pebbles and sand had they been associated with the quartz when it was being formed into pebbles. The conclusion I therefore come to is this, that the quartz pebbles of this region, perhaps also, of the Atlantic coast, is the debris from the decomposition and disintegration of the older rocks as the Oneida conglomerate, coal conglomerate, etc., and brought here principally by the ice and water of Glacial time. About the first of October, I made the first critical examination of the land lying between Spruce and Walnut streets and west of Forty-fifth street, where the sand and gravel has been excavated to, or within a short distance of the bed-rock. Here are exposed

many large angular and rounded blocks of Oneida conglomerate, Medina sandstone and probably Clinton and Oriskany sandstone. These blocks vary from one or two cubic feet to twenty-five, many of them still preserving their sharp angles; on several blocks I could clearly define Glacial scratches.

Flat and angular boulders which I have observed still imbedded in their original position, are lying at different angles to the horizon. Toward the lower part of the bed of sand, gravel, and boulders, I have noticed frequently a large amount of angular and broken bed-rock or mica schist. A few boulders of Oneida and Medina just south of Pine street and west of Forty-fifth street were also observed. The average line of deposit of these large boulders is N. 42° E. or at right angles to the average course of the Schuylkill River.

In carrying this line northeastward it crosses another similar deposit between the tracks forming the Y at the junction of the P. C. R. R. and N. Y. branch, about the corner of Thirty-eighth and Hutton streets, and another more extensive deposit near Thirty-eighth street and Girard avenue. The excavation is now going on near Girard avenue, and I was enabled to see many of the larger blocks still in position; the average of these are deposited at angles to the horizon.

Among those at Thirty-eighth and Hutton streets are blocks of Oneida conglomerate and Medina sandstone. Large quantities of New Red sandstone, and a few blocks of trap rock were also observed. From all these evidences I have concluded that this belt of drift deposit is no other than a Glacial moraine, formed by the Schuylkill Glacier receding from the site of the City. It is very possible that we have here a complicated system of moraines formed as the scratches in the North by the ice at different stages of its existence. J. H. Harden, M. E., procured some specimens of conglomeratic sandrock, with casts of *Spirifer* which I have been unable to determine. Mr. J. C. Smith afterward obtained a specimen of Oriskany sandstone with *Spirifer arenosus*, from a deposit west of Forty-fifth street and north of Walnut.

I am indebted to Mr. J. H. and E. B. Harden for the accompanying map, on which they have carefully located all the principal boulders observed in the locality first mentioned. One fact I will add is, that the surface of the gneiss where laid bare is comparatively smooth, and shows evidence of having been polished, though so soft as not to retain the marks of Glaciation.